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ARISTOTLE ON "COMING-TO-BE" AND "PASSING AWAY"

By Paul Shorey

Aristotle's *Politics* is a textbook in the Harvard Law school. The King Edward professor of English at Cambridge University invites his students to devote a term to what our colleges style "the intensive" study of the *Poetics*. Formal logic can still be learned sufficiently well from the Aristotelian Organon. The *Rhetoric* would be generally acknowledged to be one of the best extant textbooks of the subject. Mill, Sidgwick, Leslie Stephen, and other modern moralists still quote the *Ethics*, not merely as a historical document, but for substantive ideas, and valid distinctions. In these domains the experience of the Greeks and his own observation provided sufficient material for Aristotle's schematizing, organizing, and analytic mind, and his results, though modifiable by our wider experience, can never be wholly superseded. In the physical sciences, with the partial exception of descriptive biology (the natural history of animals, etc.), the logical mill ground in vacuo. Aristotle's physical treatises could never, like the *Ethics* and *Poetics*, be profitably studied for their content, by large classes of students. The *De Caelo*, as leading up to the cosmogony of Dante and the Middle Ages, has a certain historic interest. If the *De Anima* retains all its significance, it is because psychology is not, and never will be, a progressive science, as the chapter on the subject in Professor Thomson's *Outline of Science* is enough to show. But modern knowledge has so far superseded the *Physics*, the *Generation and Decay*, and the *Meteorology* that their interest, even for the history of science, is but slight, unless we stretch the term to cover metaphysics. Only a student of metaphysics can be edified by the spectacle of so keen and high-soaring an intelligence beating in the void its wings in vain.

Ignorant of facts and principles familiar to every modern schoolboy student of "fourteen weeks in science," Aristotle imperturbably deduces from a priori assumptions and the synonyms and idioms of the Greek language a general philosophy of what would now be called physics and chemistry, and is rarely at a loss for a verbal explanation of any phenomenon that attracts his attention. "He corrupts physics with logic," said Bacon. "Everything that he affirms is false," was the thesis of another exasperated philosopher of the Renascence. "What more exquisite jargon could the wit of man invent," asks Locke, "than the definition (of motion) the act of a being in power, so far forth as in power," and a modern physicist would concur in this derogatory estimate if he opened the *Generation and Decay* and read that to learn or unlearn music is an ἀλλοίωσις of man, but a γένεσις or φθορά of musical-man, or that if anything moves without being moved it would touch the object moved but not be touched by it (323 a 32), or that in so far as the accretion is the potentiality of quantified flesh it is growth and the increase of flesh, but in so far as it is merely the potentiality of flesh it is food and nutriment (322 a 26), or that the true cause of growth is the indwelling augmentative principle (322 a 12). It would be useless to remind him of Lord Kelvin's avowal that after fifty years of teaching physics he knew no more of the ultimate structure of matter than when he began, or of Professor Thomson's evasion, "the atom of every element is revealed as a particle of electricity. What electricity is itself we do not know." In vain should we urge that Aristotle's speculations on these matters are little less ingenious in suggestion or subtle in dialectic than the antinomies of Kant or Herbert Spencer's Unknowable, or Judge Stallo's concepts of modern physics. For the physicist as such is not interested in the dialectical analysis of his presuppositions, even as carried on by writers not unacquainted with the terminology and the results of recent science. Still less will he have the patience to disengage the anticipations of the modern metaphysics of science from the guesses of a writer who thought that the function of the brain was to cool the blood, and was unaware of the existence of oxygen. To measure the speculative value of thoughts imbedded in such a mass of childish error will be a task for the truly philosophical historian of Greek philosophy.[1]

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[1] Cf. Professor Karl Pearson, *The Grammar of Science*^{2}, p. 192: "A good deal that is suggestive with regard not only to space and time, but position and motion may still with caution be extracted from the *Physics* of Aristotle. . . . . The reader must not be discouraged by the unwarranted contempt expressed for Aristotle's ideas of space and motion in George Henry Lewes' *Aristotle*."

All that I shall attempt in this philological journal is on the occasion of Professor Joachim's excellent edition of the *De Generatione*[1] to put together a few notes, adumbrating what I conceive to be the right method of approach to one of Aristotle's scientific treatises.

A truly critical interpretation must not lose itself, either in denunciation of Aristotle's errors, which may be taken for granted, or in a continuously apologetic exposition of the ingenuity and consistency of the system and the terminology. It must endeavor to explain the work by the history of Aristotle's own mind. What did he presuppose? What did he know? How did he get to know it? How did he come to write this treatise? That, and not an abstract and didactic exposition of his entire philosophy, is the proper introduction to any particular book of Aristotle. To sum it briefly, then, the knowledge presupposed in all his works was the Platonic dialogues and his own *Logic*, *Rhetoric*, and *Topics*. To this must be added, for the ethical and political works, his observation of the life of fourth-century Athens; for the biological works his inheritance of the tradition of Greek medicine; for the metaphysical and physical works, his study of the pre-Socratic philosophers.

For the purposes of this treatise his assumptions may be reduced to his general conception of the physical universe, which he seems to have adopted early and never to have modified—a finite world existing essentially unchanged from all eternity, the four elements in the sphere of change below the moon each having a natural place of its own to which it tends to move, a fifth element, immune to change, composing the stars and the heavens, the four causes, the derivation of the four elements from the four qualities—hot, cold, moist, and dry—the reality of instant and complete qualitative change, an underlying first matter, which is the potentiality of the four elements and all that comes from them, the distinction of potentiality and actuality as the pass-key to all metaphysical puzzles.

These things he endeavors to demonstrate, some of them in this treatise, and some of them elsewhere. But it is evident that he does not get them from demonstration, but that they are the fixed presuppositions of his thinking throughout. He always employs them in the criticism of other systems, and he cannot conceive other men's ideas when they come into conflict with them. From his own logic he derives of course his penchant for the formal syllogism, and his habit of attributing errors and differences of opinion to false syllogisms.[1] More fundamental than this, however, is the topical method of arguing exhaustively for and against a thesis. This method, worked out in his *Topics* and in his *Rhetoric,* he himself employs in all his writings in the examination of the conflicting opinions of the people or the philosophers. He cannot forbear to treat every opinion of a Plato, an Empedocles, an Anaxagoras, a Democritus, as a thesis to be assailed as in a courtroom, in all the forms and devices of controversy elaborated in his *Topics.* And he frequently interrupts the main course of his exposition to exercise his dialectical ingenuity in this way. The practice of this method undoubtedly multiplied his ideas and made him fertile and ingenious in the invention of arguments. But it also tempted him to find a place in his texts for all arguments good and bad, and so was the chief cause of the impression of captious sophistry which much of his criticism of his predecessors leaves upon the mind. Instead of confining himself to what Empedocles or Plato probably intended to say, with due allowance for the part of metaphor and symbolism in their expression, he omits nothing that could be said against their statements, accepted literally, by an ingenious special pleader.

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[1] Cf. *infra*, p. 369.

The suggestion of this treatise, like its title, quite obviously came from Plato's *Phaedo,* which lays down the principle that all things come into being from their opposites, speculates on the causation of increase or growth, and canvasses the theories of the pre-Socratics. The treatise had, of course, other motives, as for example, the fuller deduction from the fundamental opposite qualities, of the four elements already deduced in the *De Caelo* from the doctrine of natural places and motions. After a brief analysis of the whole the chief aim of this paper will be to verify some of these introductory generalizations, and more especially to illustrate the dependence on Plato, to which Professor Joachim's otherwise admirable commentary does something less than justice.

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[1] E.g., in the criticism of the Atomists, 317 a 2, with Joachim's note, p. 84. The Aristotelian commentators make this more explicit; cf., e.g., Themistius on *Physics* 4. 1: *διὰ τὴν ἄγνοιαν τῆς ἀντιστροφῆς*, and 4. 4: *δι' ἄγνοιαν τῶν συλλογισμῶν*.

There are two books. The first is concerned chiefly with the precise meaning of coming-to-be and passing away, but we need the Greek terms, and the discrimination of genesis from alloiosis, and growth, and other forms of change, including mixis or mixture. The discussion often takes the form of a criticism of the pre-Socratics and Plato. The reality of qualitative change is for Aristotle a fact of experience and a fundamental assumption. It is something that all intelligent modern physicists are aware no juggling of unchangeable atoms or mechanistic theory can explain. Aristotle sometimes expresses sympathy for the scientific temper of the Atomists and it is sometimes, though I think wrongly, said that he himself explains the production of qualities by rarefaction and condensation. But that is not his real meaning. He is aware that quality and the changes of quality are ultimate facts of experience. We are no nearer a real explanation today, and Plato whose theory of elements composed of mathematical planes Aristotle thinks breaks down in its inability to account for qualities, slips in an unnoticed phrase, which shows that as usual he was entirely conscious of what he was doing. To his "probable" account of the way in which the physical elements produced pathemata (qualities as apprehended by us) he prefaces the statement πρῶτον μὲν οὖν ὑπάρχειν αἴσθησιν δεῖ τοῖς λεγομένοις ἀεί (*Tim.* 61 c), which in its entire context means that every mechanical and every mechanistic or purely physiological explanation of sense qualities presupposes a physiological psychology with all its metaphysical connotations. That is still a pertinent warning. The fact of qualitative change, then, is ultimate for Aristotle. While genesis is a complete transmutation of one thing into another (317 a 22); in alloiosis a perceptible substrate of the change persists (319 b 11). The distinctive feature of Aristotle's definition is that the change is complete and may take place all at once, as when water passes into ice, or milk into cheese. The suggestion comes, perhaps, from Plato *Parmenides* 156c, πότ' οὖν μεταβάλλει with the answer, that the change takes place in that strange entity, the sudden, τὸ ἐξαίφνης.[1] The pre-Socratics, Aristotle thinks, lacked these clear-cut conceptions, as they doubtless did. Aristotle himself, as Professor Joachim observes (pp. 194 and 198) does not consistently observe his own distinctions. He frequently uses γένεσις in the broad Platonic sense that includes every form of γίγνεσθαι.

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[1] Cf. Höffding, *Philosophical Problems*, p. 102, "The single instant in which, on the one side, stands a 'no more,' on the other side a 'not yet,' presents the problem in its whole intensity, an intensity which only the numbing power of custom can lessen."

Much of his somewhat captious criticism of his predecessors merely goes to show that they overlooked the distinctions embodied in his terminology, and that their other utterances were incompatible with their theories of matter if completely thought out. There is in fact no evidence that they had considered the problem of qualitative change very deeply or consistently, still less that they consciously played with the equivocal meanings of γίγνεσθαι which Plato employed to blend the physical problem with the verbal problem of predication in the *Phaedo* and the *Theaetetus*. They merely denied the possibility of creation out of nothing, or of the destruction of substance, as Aristotle in fact also did, though he recognized that common parlance for convenience speaks of a ἁπλῆ or absolute γένεσις. (Cf. Joachim on 318 a 27 ff.)

He here proceeds to complain that they do not conform to this extemporized classification; Anaxagoras did not understand his own "voice."[1] For though he assumes many elements and not one, he says that gignesthai and apollusthai are the same as alloiousthai. Anaxagoras, in fact, does not say this in terms, and probably does not use the word alloiousthai at all.[2] Like the other pre-Socratics he is concerned only to reject the popular superstition that believes in absolute creation and destruction. What the Greeks mistake for that is only concretion and discretion. Some of the neo-Platonic commentators defend Aristotle by saying that concretion and discretion is genesis, for a pluralist, while the monist Anaximander could not recognize genesis in any sense. Professor Joachim seeks to justify Aristotle by the refinement that chremata, or things, in Anaxagoras had a different meaning (included qualities?). Aristotle extends his criticism to Empedocles in a still more puzzling form. Empedocles, he thinks, ought to say that genesis differs from alloiosis, and he does once say it in the famous sentence, "There is no phusis of anything, but only mixis" (314 b 7).[1] But he and all who postulate unchanging elements deny or cannot explain the fact of qualitative change. And Empedocles contradicts not only experience, but himself, for the elements when united in the sphere cannot constitute an absolute unity unless they are fused and changed, and being unchangeable they cannot change.

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[1] 314 a 13. The phrase is probably proverbial. In *Physics* 1, 4, the substance of the criticism is anticipated; there, however, ἐκκρίνεσθαι not ἀλλοίωσις is the process by which the diversity of things is extracted from Anaximander's ἄπειρον, and the phrase about Anaxagoras, not understanding himself does not occur. But Themistius introduces it into his paraphrase of the *Physics* passage.

[2] Professor Joachim does not raise this point; it is examined by Professor Heidel, "Qualitative Change in pre-Socratic Philosophy," *Archiv für Geschichte der Philosophie*, XIX, 369.

In these and similar criticisms Aristotle hopelessly tangles himself up in the attempt to compel the pre-Socratics to think things out more fully than they did and to force his own definitions and distinctions upon them. All endeavors of modern scholars to disentangle this skein are foredoomed to failure. The most that would be possible would be a minute commentary on every phrase of Aristotle and on the probable meaning of his confused and ambiguous statements. The scientific logic of the Atomists, he thinks, is more consistent, and as usual he contrasts it with what he deems the unscientific fancies of Plato's *Timaeus*, and his construction of the elements out of triangles and planes, which logically would reduce matter to points, that is, to nothing. Aristotle always affects to take this construction of the elements out of planes and triangles in the *Timaeus* literally, and brings his topical method of refutation against it. He ignores Plato's explicit qualification (*Timaeus* 56 b) that he assumes solidity. *τὸ μὲν τῆς πυραμίδος στερεὸν γεγονὸς εἶδος πυρὸς στοιχεῖον.* Plato knows as well as Professor J. A. Thomson that we have no real explanation of qualitative change. But here, as in the assumption of sensation already noticed, he leaves no obvious loopholes in his logic. Plato and the Atomists lead Aristotle on to a digression on the metaphysics of the divisibility of matter (316 b 317 a), which is neither better nor worse than that in Herbert Spencer's Unknowable. From this he passes to a general discussion of the problem of becoming, followed by his own definition and discrimination of *γένεσις*, *ἀλλοίωσις*, and *αὔξησις*, which his predecessors had confused.

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[1] Professor Joachim without argument rejects Burnet's interpretation of *phusis* here. He is unacquainted with the Chicago dissertation of Dr. Beardslee, *The Use of Φύσις in Fifth Century Greek Literature*, where the entire matter is cleared up.

This so-called problem of becoming or coming-to-be cannot be made intelligible in abstract English terminology. As found in Aristotle, it involves in inextricable confusion real difficulties concerning the ultimate nature of matter and qualitative change, and verbal, not to say sophistical, puzzles, that turn on Greek idiom. We must think in Greek terms in discussing it. At least three meanings of "become out of" or "from" (γίγεσθαι ἐξ) may be distinguished: (1) The becoming of something out of nothing, which Aristotle says the earlier philosophers chiefly feared, and which he himself did not really admit. (2) Becoming in the physical sense, which may subdivide into (*a*) the becoming of a concrete thing, as a chair out of wood, or a statue out of stone, (*b*) the becoming of a quality or state, of or in the concrete thing, as, "How camest thou speakable of mute?" or the becoming hot from cold, wise from ignorant, red from yellow. (3) The logic of Plato's doctrine of Ideas, as employed in the *Phaedo* (102) and the *Theaetetus* (155) introduces another application of the phrase, which to those who will not adopt at least provisionally his language, seems a mere quibble. Socrates is smaller than Theaetetus, and larger than (say) Simmias. If we consider him in relation to Simmias, he becomes large from small, without undergoing any change. Plato, who plays masterfully with all systems and all philosophical languages, translates all forms of becoming, whether objective and real, or subjective and relative to our point of view, into a common terminology of predication in Greek, and explains the puzzle about Socrates' changing without changing, in one philosophical dialect, in the *Phaedo*, and in another in the *Theaetetus*. There is no confusion in Plato's mind or writings with regard to any of these meanings and becomings or becoming from. He no more than Aristotle or the pre-Socratics entertains the idea of a becoming out of absolute nothing. His Sophist is painfully explicit on the distinction between the relative not-being—the not being this or that, out of which a something else may become—and the absolute not-being, with which human thought and language can do nothing. And the language of the Republic, Euthydemus and Cratylus shows that Plato is clearly aware of the distinction, even when he allows himself to play, dramatically or rhetorically, with equivocation. Wilamowitz and others have denied this; but as they have made no attempt to answer my specific arguments and interpretations, it would be a waste of paper for me to repeat them.[1] When Ktesippus grew angry at the Sophist's argument, that if he wishes Klinias to become wise or ignorant he desires him to be what he is not, and not to be what he is, that is not to be, or to be annihilated. Socrates admonishes him not to quarrel about words.

If Euthydemus knows a way to cause men not to be in a sense that makes them to be wiser, let us welcome his performance in whatever terms he may describe it.[2] The apparent confusion in the *Phaedo* and *Theaetetus* of a physical change with a change in which the new predicate merely expresses the point of view of the speaker's mind is a still more complicated matter. But a close study of the two passages will show that Plato himself is nowhere confused. He knows what he is doing. He is consciously adopting two extreme and diametrically opposed philosophical terminologies, and translating the same problem into the language of both. In the one Socrates is larger than Theaetetus this year and smaller next year, because of the indwelling presence of the ideas of largeness and smallness. In the other, all things being relative, and there being no fixed substance, the sick Socrates is a different entity from the well Socrates, and Socrates next year is not the same as Socrates this year. Socrates-compared-with-Simmias is a different thing from Socrates-compared-with-Theaetetus.

Aristotle's own thought is also probably fairly clear in this matter, except of course, in so far as a real explanation of qualitative change still baffles our science. Confusion begins only with the application of Aristotle's rigid definitions of γένεσις and ἀλλοίωσις to his captious criticism of the pre-Socratics and Plato. It was impossible for Aristotle to recognize, or admit, the extent of his indebtedness to, or his agreement with, Plato. Throughout his writings he re-explains the equivocation of the absolute and the relative μὴ ὄν, with no distinct recognition that Plato had anticipated him. Though his doctrine of the four causes is plainly derived from Plato, he repeatedly asserts that Plato overlooks the efficient cause.

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[1] Cf. my *Unity of Plato's Thought*, pp. 53 ff., and Wilamowitz, *Platon*, I, 557; II, 204.

[2] Euthydemus 283, 285 A.

The poetical language of the *Timaeus* irritated him, and he could not or would not see how slight, in view of the ultimate inconceivability of space and matter, was the difference between Plato's space, a mysterious entity apprehended by bastard reasoning, the πανδεχές, or mother of all generation, on which the ideas of the four elements impress themselves in some mysterious manner, and his own first matter, the potentiality of all the elements, but incapable of existing apart in actuality. And to return to our problem of coming-to-be, he regarded every deviation from his own terminology in Plato as a failure to apprehend the ideas and distinctions which for himself were inseparable from that terminology. There is little doubt, then, about Aristotle's general meaning. The task of interpretation is to determine in particular utterances the amount of confusion and misconception that results from his determination to put his predecessors in the wrong.

Plato, in the *Timaeus*, sets forth in poetical imagery the relation between the visible elements in a world of mutability, on the one hand, and space and the Ideas on the other. As contrasted both with the Ideas and with space, the elements as we know them are unreal and impure. Ideal fire is a determinate entity, but of any fire presented to our senses in the flux of mutability, we cannot safely pronounce that it definitely is this or that. It is only a portion of space, firely qualified—that has taken on some of the quality of fire in so far as it has been able to receive in some mysterious way the imitations of the true fire that are impressed upon it—that enter into it and pass away. It is a such, but not a this or that. We should reserve all terms that imply reality and stability for the portion of space thus qualified, and not predicate them of the fleeting qualities that come and go.

Now as a physical doctrine this does not greatly differ from Aristotle's conception of the relation of the elements as they fall under our observation, to the elements in their ideal purity and to the first matter that is their potentiality. But the metaphysical and poetical terminology conveys a very different impression. The language in which Plato contrasts the world of generation with eternal changeless space here is nearly that which he elsewhere employs to contrast the things of generation with the ideas. He has been driven, however reluctantly, to posit another eternal, unchanging reality beside the Ideas. As I have elsewhere said,[1] he is confronted by the difficulty of which Berkely speaks in his *Principles of Human Knowledge* (sec. 117), the alternative of thinking "either that real space is God, or else that there is something beside God which is eternal, uncreated, infinite, indivisible, immutable." Plato illustrates his meaning by a comparison. If an artisan continually fashions transitory shapes out of a mass of, say, gold, it would be safer to designate them as gold than by the names of the impermanent forms. This means little more than that space or the mother of generation plays in his system essentially the same rôle as that of Substance in Spinoza, *l'étendu* in Descartes, the ἄπειρον in Anaximander, or the first matter in Aristotle—with the difference of course that the Ideas are always in the background as the real cause of the modifications of the one substance. Returning to the question in a later passage of our treatise, Aristotle, however, by pressing the illustration and applying his own terminology to it, finds occasion to cavil. Nothing is defined in the *Timaeus*, he complains (329 a 13 ff.). We are not told whether the πανδεχές is separable from the elements (can exist by itself in reality and not merely in thought). Nor does Plato make any use of it in *Physics*, though his illustration from gold implies that it is the ὑποκείμενον, or underlying substance of all things. Again, to press the image still further, Plato's language is incorrect. Objects made of gold are, properly speaking, not gold but golden. This is a point of Greek usage and his own technical terminology which Aristotle expounds several times. We must distinguish the becoming out of matter γίγνεσθαι ἐξ ὕλης as when a statue becomes out of a stone, and becoming from a privation, as white from black, well from sick, wise from ignorant. Aristotle admits that the point of view may change, and that the stone may be thought of, not as the matter, but as the privation of the form of the statue, and that there are other considerations that may confuse Greek usage. But normally the distinction holds, and involves a further consequence. In a γίγνεσθαι ἐξ ὕλης we sometimes do not designate the result by the name of the matter, but by a derived adjective, not gold, but golden. In a γίγνεσθαι ἐξ στερήσεως we do not predicate of the result an adjective derived from the ἐξ οὗ. Of a man become well from sick we do not predicate sick, or any derivative of sick, but we may still call him a man, which is the substratum implied in the change. Our treatise applies these refinements to the censure of the *Timaeus* passage thus: Plato's "gold" is wrong because, while in a case of ἀλλοίωσις we may still call the result gold, in a case of γένεσις and φθορά we cannot, for the substance is completely transmuted and lost. Now for Aristotle the transmutations of the elements are literally γενέσεις; one element disappears, and another takes its place. For this purpose Aristotle does not treat his potential first matter as an underlying substance. We need not raise the question whether and how far he thus violates the fundamental principle of the pre-Socratics that nothing can come from nothing. In comparing the transformations of the elements, then, to the reshaping of a lump of gold which still remains gold, Plato, Aristotle argues, confuses a γένεσις with what would be at the most an ἀλλοίωσις in the looser sense of the word. His imagery, then, is misleading. But, to waive that point, Aristotle perhaps further means that he should have said golden, not gold.[1]

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[1] *Amer. Jour. Phil.*, IX, 298.

All explanations of change in the larger sense—generation and decay, alteration and growth—depend on the theory of the elements, which will be expounded in the next book (328 b 26 ff.). But all theories either of the generation of the elements themselves or of the generation of things out of the elements involve certain concepts which must be clarified first (322 b). These are: concretion and discretion, that is mixture and its opposite, and action and passion (being acted upon), which in turn involve the ideas of contact or touch. Aristotle discusses first contact (323 a), somewhat verbally and dialectically, then at greater length action and passion, then mixture. The question whether action and passion take place between likes or unlikes (323 b 324) takes him back to the theories of his predecessors again, especially to the Atomists, Empedocles and

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[1] On the whole topic, see my note on *Timaeus* 50 a, in *Amer. Jour. Phil.*, X, 63, and Joachim, on 329 a 17–21 (pp. 197–98). I do not know whether he has read my note, and it does not matter. I there say that Aristotle's criticism is that Plato has veiled an obscurity in his doctrine by using a case of ἀλλοίωσις to illustrate what is really γένεσις in the strict sense. Professor Joachim writes, p. 198, "Plato would then be criticized for extending a terminological usage which is correct in the example of the gold, and the works fashioned out of it, to an instance of γένεσις, where it is no longer applicable."

Plato. He again expresses his admiration of the consistency and scientific temper of the Atomists and in an often quoted passage finds the origin of Atomism in Leucippus' endeavor to meet the arguments of the Eleatics against a plural and mutable world. The passage (325 a 23 ff.) is in Ritter and Preller and all the histories of Greek philosophy, and I need not tell the story again. Aristotle proceeds to argue that the Empedoclean theory of body, composed of four unchangeable elements, penetrated with pores, if thought out, leads to a doctrine of void and indestructible particles, hardly distinguishable from Atomism. Empedocles does not do what Plato in the *Timaeus* says is necessary, and account for the origin of the four "elements" themselves.[1] Though Aristotle, as we have seen, does not accept Plato's own explanation, he is willing to use this postulate that the "elements" must be explained as a whip for Empedocles. And the fact that Plato's theory dispenses with empty space serves him as an argument against the pores of Empedocles and the void of the Atomists. Atoms, then, under whatever disguise, are really unthinkable.[2]

The discussion of mixture (327 a 30 ff.) cannot be made quite clear because Aristotle's own thought is not perfectly clarified. Without any knowledge of chemical facts he is struggling toward the idea of chemical combination as opposed to mechanical synthesis. Even the modern atomic and molecular theory of chemical combination would not satisfy him; for that in the last analysis is only a mechanical synthesis of immutable particles. And the practical chemist ignores the problem presented in Plato's acute remark already quoted that all such theories take for granted our sensations. Commixture, Aristotle concludes (328 b 22), is the unity of things altered in commixtion. This verbal definition throws us back on the ultimate problem of qualitative change. It does not explain how the postulate on which Aristotle insists (327 b 28) that the altered constitutents must be recoverable in the original form, can be realized. That problem was left for modern chemistry, or his own theory of the elements, to solve or evade. It is hard to follow Aristotle's imperfect thought here. In what process known to him were the elements of a true (chemical) mixture recoverable? What does he mean by saying that a drop of water in ten thousand measures of wine is not mixed, but dissolved and changed into water? The language recalls expressions in Plato's *Timaeus*.[1] Does any definite physical conception underlie the statement that a little tin, mingled with copper, operates as a disembodied quality, and disappears in the mixture, leaving only a trace of color (328 b 12)? Is it a real or a verbal argument to object to Anaxagoras' "All things were (mixed)together" that they couldn't be mixed unless they first existed apart, and that "all things" include qualities which cannot exist apart (327 b 20)? And is it an explanation or an evasion of the difficulty to bring in the universal pass-key of potentiality and actuality, and say that in the mixture the changed elements are actually altered, but potentially what they were (327 b 25)? It all depends, as we have said, on the validity of the explanation of this potentiality supplied by our theory of the elements. This, as given in book two, is a development of the account in the *De Caelo*, and is to be found in any textbook of the history of philosophy. All generation, Aristotle repeats, is from opposites. This can only mean opposite qualities. For a permanent substratum is implied in the very fact and definition of change. This potentiality of change is Aristotle's first matter, which he opposes to all pre-Socratic theories and to a very unfair interpretation of Plato's mother and receptacle of all generation in the *Timaeus*.[2]

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[1] 325 b 20–25.

[2] 326 a ff.; cf. *De Caelo* 305 b 1–3.

The fundamental opposite qualities are fourteen. Aristotle dismisses heavy and light, hard and soft, viscid and brittle, rough and smooth, thick and thin as not relevant because they do not involve action and passion. There remain warm cold, and wet and dry. The possible combinations of these, eliminating the conjunction of incompatible opposites, are warm and dry, fire, warm and moist, air, cold and moist, water, cold and dry, earth (330 b). This ingenious scheme saves the phenomena and explains the transmutation of all the elements into one another, including earth which Plato's system excluded from the cycle of change. Air becomes fire by the substitution of dry for moist. For fire to become water it must pass through the intermediate stage of air. Empedocles' theory of unchanging elements, Aristotle repeats, is not really conceivable in physical terms; it cannot explain the facts of change. Aristotle's own theory, he thinks, does. The obliquity of the ecliptic, causing an inequality in the distribution of heat and cold, from the friction of the movements of the heavenly bodies, brings about a perpetual interchanging of the elements and prevents their settling down each into its own place, and so bringing the process of change to an end (337 a). So much for the changes of the elements themselves. But what of the infinite variety of variously qualified things in the world, produced by combinations of the elements? Can the theory explain that? This is the ultimate problem of qualitative change, and as was to be expected Aristotle cannot attain to perfect clarity. All bodies in the world of change contain a mixture of the four elements (334 b 31). This he proves to his own satisfaction and confirms as Anaxagoras did his theory by the fact that organic bodies find nourishment for all their parts, in all kinds of food, but not in any one element (335 a 12). Without going into further detail he seems to take it for granted that the blending of different degrees and potencies of the qualities of all the elements in such mixtures would account for the infinite diversity of qualities in the world. And so he passes on to reconsider the causes of generation and decay generally, and the reason why the process is eternal.[1] This takes him back to his own theory of the four causes, as expounded in the physics and metaphysics. Plato (in the *Phaedo*), he unfairly argues (335 b 10 ff.), ignored the moving or efficient cause, and assumed that the idea or formal cause impressed itself somehow on matter. The pre-Socratics, he repeats, generally overlooked the formal cause (335 b 35). His own theory is an exhaustive and adequate account of all causation. The ultimate efficient cause of the changes below the moon is, as already explained, the obliquity of the ecliptic. The process is eternal because the revolutions of the heavens never cease. A final chapter, which may be regarded as an appendix, discusses the old problem of necessity and its various meanings.

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[1] Cf. 328 a 26, *μεταβάλλει εἰς τὸ κρατοῦν* with *Tim.* 57 b, *ξυνίστασθαι—εἰς τὴν τοῦ κρατοῦντος ἰδέαν*.

[2] See my Interpretation of the *Timaeus*, *Amer. Jour. Phil.*, IX, 416.

It is beginning to be recognized that in the mental and moral sciences an explanation of its relation to Plato, such as Finsler gives for the *Poetics*, or Burnet for the *Ethics*,[1] is almost a complete interpretation of any Aristotelean treatise. Aristotle's indebtedness to his teacher is much less and less obvious in the scientific works. But even here, though Aristotle himself stresses the divergences and though the systematic elaboration of the detail is his own, the indebtedness for large ideas, points of view, problems, distinctions, and terminology is much greater than appears from the explicit mention of Plato's name or quotation of his words. This has been so generally overlooked that it may be worth while to collect the evidence from our treatise and thus show how even Professor Joachim has missed some shades of meanings that a reference to the relevant Platonic passages would have brought out. To begin with he does not seem to think it worth while to mention that the very title of the book is a phrase of the *Phaedo*[2] as the title of Malebranche's *Recherche de la Vérité* is a phrase out of Descartes. Yet it points us at once to the fact that the dominant idea that all generation is in some sense out of opposites is also taken from the *Phaedo*.

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[1] Cf. *infra*, p. 352.

From the *Phaedo*, too (e.g., 96 d ff.), comes much of the phrasing of the problem of growth (321 a 30). This is obscured by the fact that Plato is not discussing nourishment or organic growth specifically, but the question of relative size and augmentation.[3] Aristotle, as usual noticing only differences, complains (315 a 29) that Plato (sc. in the *Timaeus*) considers the generation of the elements only. The question why the process of change and generation goes on forever (317 b 35, 318 a 17, 336 a 29) also originates in the *Phaedo*,[4] though Aristotle and his editor refer only to the *Timaeus*. These and similar suggestions from the *Phaedo* are combined with hints from other dialogues. The *Cratylus* and *Theaetetus* contribute the fundamental distinction of the two kinds of change or motion, as Plato calls it, namely transference and alteration. From the *Euthydemus* (283 d, 285 a) comes the verbal puzzle that to become wise and so not to be ignorant is not a case of becoming and passing away absolutely (318 a 35, 319 a 9 *Met.* 994 a 30).

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[1] Cf. also "The Idea of Good," *University of Chicago Studies*, I, 209.

[2] 95 e; cf. *Met.* 988 b 26.

[3] But in 70 b, he uses the Aristotelean terms αὔξησις and φθίσις, and, as Aristotle does, when he forgets his definition, subsumes them under γένεσις.

[4] Cf. *infra*, p. 352.

The *Lysis* (214 b) supplies the classification of pre-Socratic thinkers into those who attribute action and passion to likes and to unlikes (323 b I). Add to these ideas the explicit references to the *Timaeus*, noted in part by Professor Joachim, and it is apparent how great a gap the removal of all suggestions derived from Plato would leave in the treatise. A resurvey of the whole in order will bring this out more fully, and give opportunity to discuss Professor Joachim's interpretation of some doubtful points.

314 a 5 *χωρὶς ὥσπερ διώρισται καὶ τοῖς ὀνόμασιν.* Despite the modern commonplace that the Greeks, knowing only one language, could not distingulsh ideas from words, Plato often insists on the distinction. *Republic* 471 b seems to anticipate Aristotle's phrasing *ὥσπερ καὶ ὀνομάζεται.*

314 a 19. "There is no evidence that Anaxagoras used the term *ὁμοιομερῆ.*" Plato *Protagoras* 329 de, is presumptive evidence that he did not.

314 b 37 *ἔτι δ' ὁμοίως ἀναγκαῖον εἶναι τοῦτο καὶ ἀλλοίωσιν.* This, which Professor Joachim thinks not very clearly expressed, is a reproduction of a common Platonic argument, which occurs, e.g., in *Phaedo* 77 a, *εἰς τὸ ὁμοίως εἶναι*, etc. For the *anagkaion* cf. 76 e.

315 a 18, Joachim reads *οὐ γὰρ δὴ πῦρ γε καὶ γῆ καὶ ὕδωρ ὄντα ἓν ἦν τὸ πᾶν.* Becker's reading *ἔτι ὄντα* could be supported by a reference to *Symposium* 187 a, *ἐκ διαφερομένων ἔτι εἶναι*, which is also used to puncture a bubble of pre-Socratic paradox.

315 b 10–15, neither Philoponus nor Joachim observes that Aristotle's interpretation of the philosophy of Democritus here goes back to Plato. The two main points, *τἀληθὲς ἐν τῷ φαίνεσθαι* and *ὅλως ἕτερον φαίνεσθαι ἑνὸς μετακινηθέντος*, are plainly suggested by the *Theaetetus*, whatever be the source of the illustration "Tragedy and comedy are composed of the same letters." Cf. *Theaetet.* 159 b, *τὸν ἀσθενοῦντα Σωκράτη ὅλον τοῦτο λέγεις, ὅλῳ ἐκείνῳ τῷ ὑγιείνοντι Σωκράτει*, with 158 e, *ἀλλ' ὅλως ἕτερον*, and many other passages. The dependence on the *Theaetetus* of this line of thought in Aristotle could be further illustrated by the discussion of the Pythagorean measure in the *Metaphysics* 1005–6.

318 a 17, the question *διὰ τί ποτ' οὐκ ἀνήλωται πάλαι καὶ φροῦδον τὸ πᾶν* is plainly an echo of *Phaedo* 72 c, *μὴ οὐχὶ πάντα καταναλωθῆναι εἰς τὸ τεθνάναι.*

320 b 34, *ληπτέον δὴ μᾶλλον οἷον ἀπτομένους τῆς ζητήσεως ἐξ ἀρχῆς, ποίου τινὸς ὄντος. . . . . τὰ αἴτια ζητοῦμεν.* Joachim writes, "Probably *μᾶλλον* goes with *ἀπτομένους*. Cf. *Rhet.* 1358 a 8." The construction in the *Rhetoric* is doubtful. But Plato *Laches* 189 e *μᾶλλον ἐξ ἀρχῆς εἴη ἄν* seems to me decisive.[1] What follows is merely the frequent Platonic principle that we must define a thing before we answer other questions about it: Cf., e.g., *Laches* 190 b; *Rep.* 354 c.

321 a 30, *πότερον ᾧ προστίθεται*, to which Joachim objects, "It is not really *πρόσθεσις* but more like *μίξις*," was suggested by *Phaedo* 101 d, *τὴν πρόσθεσιν αἰτίαν εἶναι.*

336 b 16, *Πλάτων ἐν ταῖς διαιρέσεσιν, τὸ γὰρ μέσον μῖγμα ποιεῖ.* Professor Joachim's long and useful note on the alleged work of Plato, the *Diaireseis*, concludes with the suggestion that the specific reference here is to the formation of the world-soul, in *Tim.* 35 a ff. May not Aristotle rather be thinking of the classifications of the Philebus, which Plato repeatedly described as "divisions" (20 a, 20 c, 23 c, 23 e)? The subject-matter is more relevant, and the third element of the division is *τὸ μεικτόν* of the other two terms *πέρας* and *ἄπειρον* (25d, cf. 23c). On the diairesis problem generally, see my note, on *Timaeus* 48 e, *Amer. Jour. Phil.*, X, 63.

336 b 13, *πᾶς . . . . βίος μετρεῖται περιόδῳ*, cf. Plato *Republic* 546 a-c, *γεννητῷ περίοδος*, etc.

337 b 14, *εἰ οἰκία θεμέλιον, εἰ δὲ τοῦτο πηλόν.* This reasoning is from a passage of the *Cratylus*, that greatly influenced Aristotle (389). The challenge to all materialistic psychologies (334 a 11), "How, then, will the modifications of the soul take place—music, memory, forgetting?" repeats in essence Plato's argument (*Phaedo* 93 c) that if the soul is a harmony it must admit the *πάθη* of harmony and no others. Similarly Aristotle argues that it must have the *πάθη* of material elements and these only. The problem *τίς αἰτία τοῦ γένεσιν ἀεὶ εἶναι* and the Lucretian answer, 318 a 23 that the death of one thing is the birth of another come from the half-jesting passage of the *Phaedo* on the generation from opposites, "If all things fell asleep," says Socrates, "and there were no corresponding awakening, Endymion would be nowhere." The apparently identical inquiry, 336 a 16 ff., is not quite the same thing, but concerns the continuity of the process of generation. The question there is not why material

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[1] Cf. my note on *Timaeus* 48 d in *Amer. Jour. Phil.*, X, 62.

does not fail in infinite time, but why the process does not run down. Aristotle's solution is the same, *ἡ εἰς ἄλληλα μετάβασις*, caused by the revolution of the heavens and the obliquity of the ecliptic. Aristotle (337 a 8) refers to the problem as the "difficulty which some have raised" as to why the elements have not become sifted out in endless time and settled down each in its own place. Mr. Joachim comments, "It is not known who these people were." But the reference is clearly to *Timaeus* 58 a. Plato adds his own explanation of the continuity of the process (*διασωζομένη γένεσις* 58 c) which of course Aristotle does not accept.

Finally, no one seems to have observed that the concluding page is intended as a refutation of the argument for personal immortality in Plato's *Phaedo.* From the general principle that things come into being from their opposites Socrates infers that the living come from the dead as the dead from the living, and that our souls exist in Hades before they are born again here. Aristotle replies that the cycle of causation which we observe in nature does not apply to men and animals as individuals but only as types. *οὐκ ἀνακάμπτουσιν εἰς αὐτοὺς ὥστε πάλιν γίγνεσθαι τὸν αὐτόν.* The argument in itself would perhaps prove little. What confirms the reference to the *Phaedo* is Aristotle's repeated use in this connection of *κύκλῳ* and *ἀνακάμπτειν*, for Plato writes, 72 b, *εἰ γὰρ μὴ ἀεὶ ἀνταποδιδοίη . . . . ὡσπερεὶ κύκλῳ περιιόντα ἀλλ' εὐθεῖά τις εἴη ἡ γένεσις . . . . καί μὴ ἀνακάμπτοι πάλιν*, etc., where the further correspondence is to be noted between Plato's *εὐθεῖά τις εἴη ἡ γένεσις* and Aristotle's *εἰς εὐθὺ . . . . ἡ γένεσις.* I am not unaware that Aristotle goes on to apply the *κύκλος* to causation in a somewhat different sense from that in the *Phaedo*, and more nearly resembling the use of the word in *Republic*[1] 474 A. But the general parallelism of the thought, supported by the verbal identities, justifies us in adding this passage to the many conscious reminiscences of the *Phaedo* in our treatise.

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[1] See my note. *Class. Phil.*, V, 505. Cf. also *Tim.* 49 c, *κύκλος τὴν γένεσιν.*